SYSTEMS AND METHODS FOR NETWORK STABILIZATION PREDICTION

RELATED APPLICATION

[0001] This application claims the benefit of priority of U.S. Provisional Patent Application No. 62/745,474 filed on Oct. 15, 2018, the contents of which are incorporated herein by reference in their entirety.

BACKGROUND

[0002] The present invention, in some embodiments thereof, relates to networks and, more specifically, but not exclusively, to systems and methods for prediction of network dynamics.

[0003] Newly introduced networks are analyzed to determine, for example, whether the new network is able to perform its function properly, whether users using the new network are provided with the designated user experience, and whether the new network is adopted as expected by users.

SUMMARY

[0004] According to a first aspect, a method for evaluating a network by predicting stabilization of the network, comprises: providing a plurality of graphs each indicative of a respective sequential snapshot of a dynamic graph obtained over a historical time interval, the dynamic graph denoting the network, computing a plurality of sets of meta-parameters, each set of meta-parameters computed according to a respective graph of the plurality of graphs, wherein each one of the meta-parameters denotes a network level parameter computed according to a plurality of at least one of edges and nodes of the respective graphs, analyzing the plurality of sets of meta-parameters according to values computed based on a physics-based analytical model of an evolving physical system, and predicting a likelihood of stabilization of the network during a future time interval according to an indication of convergence of the values according to a convergence requirement, computed based on the physics-based analytical model during the future time interval.

[0005] According to a second aspect, a system for evaluating a network by predicting stabilization of the network, comprises: at least one hardware processor, and a non-transitory memory having stored thereon a code for execution by the at least one hard are processor, the code comprising instructions for: providing a plurality of graphs each indicative of a respective sequential snapshot of a dynamic graph obtained over a historical time interval, the dynamic graph denoting the network, computing a plurality of sets of meta-parameters, each set of meta-parameters computed according to a respective graph of the plurality of graphs, wherein each one of the meta-parameters denotes a network level parameter computed according to a plurality of at least one of edges and nodes of the respective graphs, analyzing the plurality of sets of meta-parameters according to values computed based on a physics-based analytical model of an evolving physical system, and predicting a likelihood of stabilization of the network during a future time interval according to an indication of convergence of the values according to a convergence requirement, computed based on the physics-based analytical model during the future time interval.

[0006] According to a third aspect, a computer program product for evaluating a network by predicting stabilization of the network, comprises: a non-transitory memory having stored thereon a code for execution by at least one hardware processor, the code comprising instructions for: providing a plurality of graphs each indicative of a respective sequential snapshot of a dynamic graph obtained over a historical time interval, the dynamic graph denoting the network, computing a plurality of sets of meta-parameters, each set of meta-parameters computed according to a respective graph of the plurality of graphs, wherein each one of the meta-parameters denotes a network level parameter computed according to a plurality of at least one of edges and nodes of the respective graphs, analyzing the plurality of sets of meta-parameters according to values computed based on a physics-based analytical model of an evolving physical system, and predicting a likelihood of stabilization of the network during a future time interval according to an indication of convergence of the values according to a convergence requirement, computed based on the physics-based analytical model during the future time interval.

[0007] At least some of the systems, methods, apparatus, and/or code instructions described herein address the technical problem of predicting stabilization of a network. The network may be implemented, as, for example, a new platform, service and/or digital-interaction interfaces, such as blockchain-based tokens or cryptocurrencies, new social media applications, for example, telegram, slack. The network may be a new architecture, for example, an upgrade of an existing wireless network to provide more wireless bandwidth to mobile device. The network may be based on interaction between entities that may be controlled by users and/or may be automated, for example, interactions between user accounts, for example, trading of data objects between user account, and interactions between network nodes by automatic transmission of data packets over the network. Human-behavior based platforms and/or automated based network may not necessarily succeed and stabilize, for example, becoming a mainstream tool. The ability to analyze and predict the dynamics and stabilization of such new platforms is of immense value, for example, to consumers who use them, investors who must select where to put their capital in, for regulators who follow their advance, and network architects that are attempting to design a stable hardware and/or software architecture for the network. In another example, prediction of stabilization of the network may be used to determine the timing for performing certain actions on the network. For example, analyzing the network to identify the largest and most busiest hub in order to increase bandwidth to the hub may be performed once the network has stabilized. Performing such analysis early may be futile when the network is still unstable and evolving, since upgrading the hub identified too early may be a waste of resources when the network is expected to stabilize in the future to a different hub.

[0008] Current state-of-the-art prediction tools employ, for example, machine learning algorithms to attempt and predict, for example, the value of an asset or token (e.g., value of Bitcoin), or to predict specific instance of a network component (e.g., predict the next big network hub). Such machine learning methods fail for new networks and/or new network architectures when the network's output (e.g., token value, network errors) has great fluctuations, since the new emerging networks have yet to be stable enough to enable